in construction,—also the quarrying, streaming and mining in stratified deposits, for gold, tin, coal, iron, salt, &c., the distribution and mineral statistics of the three last-named being given; and coal-mining and coal are fully treated, both here and in a preceding section. The last chapter describes mining operations for those valuable substances contained in cracks or fissures in various rocks, as metallic veins, and which require methods somewhat different to those that occur in stratified beds. This portion has been considerably enlarged; the geological conditions under which mineral veins occur, as well as the mode of working, are explained, additional illustrations of machinery and sections of veins being given. A useful glossary of scientific and technical words in mineralogy and geology is appended, including the explanation of numerous mining terms. Much information is usefully presented in a tabular form, and the 250 illustrations of sections and fossils are generally good. As before stated, the subject-matter is more varied than is usually found in elementary manuals, but it is concisely treated and methodically arranged, so as to form a text-book for the student and a useful practical guide for the miner, engineer, and traveller; for the author has "endeavoured not merely to describe facts and quote the observations of field-geologists, but also to teach principles, leaving it to the reader to apply those principles and digest the facts, working out thus a sufficient education in the subject;" and moreover, "if he understands the nature of the materials of which the earth's crust is made up, the order of their arrangement, and the changes undergone both in the rocks themselves and in the position they occupy, he will not be inclined to question either the value of such knowledge to practical men, or the nature of the applications of geology to practical purposes."

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

March 11, 1856.—Dr. Gray, F.R.S., in the Chair.

Observations on Strongylus filaria and Botaurus stellaris. By Edwards Crisp, M.D.

Dr. Crisp exhibited specimens and drawings of *Strongylus filaria*, which he discovered had lately proved so destructive to lambs in many parts of England. In several lambs examined by Dr. Crisp, millions of these entozoa and their ova were found in the bronchial tubes and in the intestinal canal, and he believed that many of the ova of these worms had been mistaken for *Cysticerci*; but the various stages of development could be readily traced under the microscope. Dr. Crisp had tried many experiments on the living worms as to the effect of poisons and other agents, and he believed that salt or sulphur given with the food, and the inhalation of sul-

phurous gas, under proper superintendence, would be the most likely means of destroying these parasites.

Dr. Crisp also placed on the table some parts of the anatomy of the Common Bittern (*Botaurus stellaris*), two of which birds (now comparatively rare) had recently been shot on the eastern coast of Suffolk. The bird from which the specimens were taken was a fine male, measuring from the tip of each wing 4 feet 1 inch, and from the point of the beak (when extended) to the lower part of the tarsus 3 feet. Among the peculiarities alluded to, was the smallness of the sternum, which measured only 3 inches longitudinally; the depth of keel only $\frac{3}{4}$ of an inch, and the lateral margins the same. The trachea measured twelve inches in length, and consisted of 198 imperfect rings; the bronchi of 20 semicircular elastic cartilages, readily approximated, and hence the production of the peculiar sound from which the bird takes its name. The stomach which was exhibited was large, and contained near its cardiac orifice a circle of gastric glands. A roach, weighing about four ounces, was digested at this part, but the tail, which was in the œsophagus, was intact. To show the voracity and capacity of swallow of this bird, Dr. Crisp said, that Sir W. Jardine and Mr. Yarrell had both taken a Water Rail from the stomach and œsophagus, and in Mr. Yarrell's specimen there were six small fish in addition. The pectinated claw was also exhibited, Dr. Crisp believing that it served for the purpose of cleaning the beak and mouth of the bird.

April 8, 1856.—Dr. Gray, F.R.S., in the Chair.

On Dinornis (Part VII.): containing a Description of the Bones of the Leg and Foot of the Dinornis elephantopus, *Owen*. By Prof. Owen, F.R.S., V.P.Z.S., &c.

Mr. Walter Mantell having, on his recent return from New Zealand, provisionally deposited his very extensive collection of remains of Dinornithic and other birds in the British Museum, I have gladly acceded to the wishes of that successful and enterprising collector, and of my friend the able Keeper of the Mineralogical Department of the Museum, to devote the leisure at my command to the examination of this interesting and valuable collection.

I had advanced as far as the determination of the bones of the leg, and their classification according to their species, when the distinctive characters of one series of these bones irresistibly brought a conviction that they belonged to a species of *Dinornis* that had not previously come under my notice, and a species also which, for the massive strength of the limbs and the general proportions of breadth or bulk to height of body, must have been the most extraordinary of all the previously restored wingless birds of New Zealand, and unmatched, probably, by any known recent or extinct species of this class of birds.

I was so much struck by the form and proportions of the metatarsal bone described in the memoir read to the Zoological Society,

June 23, 1846, and figured in pl. 48, figs. 4 and 5, vol. iii. of the 'Zoological Transactions,' that I alluded to it as "representing the pachydermal type and proportions in the feathered class*," and the bone unquestionably indicated at that period "the strongest and most robust of birds." By the side of the metatarsus of the species which I have now to describe, and for which I propose the name of *elephantopus*, that of the *Dinornis crassus*, however, shrinks to moderate, if not slender dimensions. But the peculiarities of the elephant-footed *Dinornis* stand out still more conspicuously when the bones of its lower limbs are contrasted with those of the *Dinornis giganteus*.

I propose, in the present memoir, to combine with the account of the leg- and foot-bones of the *Dinornis elephantopus*, that of the bones of the lower limb of the *Dinornis crassus*, which had not previously been described, and to bring out their characteristics by comparison with the bones of other species, especially those of the *Dinornis robustus*.

Commencing with the femur, I shall premise the following table of admeasurements of that bone in *Dinornis* :—

Dimensions of the femur in	*D. robustus.*		*D. elephantopus.*		*D. crassus.*	
	In.	Lines.	In.	Lines.	In.	Lines.
Length	14	2	13	0	11	10
Transverse breadth of proximal end	6	0	5	10	4	5
Fore-and-aft breadth of do.....	5	0	4	5	3	9
Transverse breadth of distal end ...	6	0	5	11	4	7
Fore-and-aft breadth of do.....	4	3	3	9	3	5
Circumference, least, of shaft	7	10	7	9	6	0

The above comparative dimensions bring out the characteristic proportions of the femur of the *Dinornis elephantopus*, as shown by its greater thickness and strength. As compared with the femur of the *Dinornis robustus*, this character is remarkably exemplified on a comparison of their articular extremities. Had these parts alone of the *Dinornis elephantopus* been preserved and submitted to me, I should have scarcely ventured upon a conclusion as to their specific distinction from the *Dinornis giganteus* or *Dinornis robustus*, the correspondence of configuration being so close, and the difference of size so slight.

The articular surface is continued from the head upon the upper part of the neck, expanding as it approaches the great trochanter, along the summit of which it is terminated by a ridge. In both species the surface for attachment of the ligamentum teres is formed, as it were, by a portion of the inner and back part of the hemisphere having been cut off obliquely with a slight excavation. The corresponding ligamentous surface in the head of the femur of the *Dinornis crassus* is relatively smaller, less depressed and less defined. The upper and fore part of the trochanter is less produced relatively to the breadth of the supra-trochanterian articular surface in the *Dinornis elephantopus*. In this species the sub-circular rough surface for the attachment of the *iliacus internus* muscle is relatively

* *Ib.* p. 325.

nearer to the head of the bone than in the *Dinornis robustus*; the rugged and thick fore part of the great trochanter descends lower upon the shaft; indeed, the shortness of the entire bone seems to depend chiefly on the shaft being relatively shorter in the *Dinornis elephantopus*. The intermuscular ridge continued from the trochanterian one seems to bifurcate sooner in the *Dinornis elephantopus*. The depression behind the trochanterian ridge is less deep in the *Dinornis elephantopus*. The oblique rotular channel is relatively as wide and deep as in the *Dinornis robustus*, but the inner boundary formed by the fore part of the inner condyle is shorter.

At the back part of the shaft the medullo-arterial foramen is relatively nearer the proximal end of the bone; the two tuberosities below this are closer together. The two sides of the fibular groove are at a more open angle, and the groove is less deep in the *Dinornis elephantopus*, the outer side being less produced.

The antero-posterior breadth of the outer and inner condyles is equal in the *Dinornis elephantopus* as in the *Dinornis robustus*; but in the *Dinornis crassus* that dimension of the outer condyle exceeds the same dimension in the inner one, and the fibular groove is more open or shallow than in the *Dinornis elephantopus*.

The generic modifications of the femur are, however, very closely preserved in each species, being strictly of the type ascribed to the genus *Dinornis* in my original memoir, Zool. Trans. vol. iii. p. 247.

Dimensions of the tibia in	*D. robustus.*			*D. elephantopus.*			*D. crassus.*		
	Ft.	In.	Lines.	Ft.	In.	Lines.	Ft.	In.	Lines.
Length	2	8	3	2	0	0	1	7	6*
				1	9	6*	1	6	6
Transverse breadth of proximal end		7	6		7	5*		6	2
					7	0			
Fore-and-aft breadth of do.....		4	9		4	6*		3	6
					4	3			
Least circumference of shaft.....		6	9		6	5		4	10
Transverse breadth of distal end...		4	4		4	2*		3	3
					4	0			

The characters of the upper end of the tibia of the *Dinornis elephantopus* closely accord with those of the *Dinornis robustus*, and the difference of size, as exemplified in the foregoing table, is so slight, that had this extremity only of the bone reached me, I should most probably have referred it to the *Dinornis robustus*. The almost flat articular surface for the inner condyle of the femur is somewhat less in its shorter diameter; the epicnemial ridge is less extended transversely; the ectocnemial ridge curves more strongly outwards; but there are individual varieties in all these characters in the tibiæ before me. All the tibiæ, however, differ in the earlier subsidence of the ridge continued downwards from the procnemial plate, which ridge is continued in *Dinornis robustus* uninterrupted by that above the inner division of the distal trochlea. The space between the ecto- and pro-cnemial plates in the *Dinornis crassus* is relatively greater than in either of the above larger species; the ridge con-

* The extremes of size in a series of several bones are here given.

tinued from the procnemial plate is interrupted as in the *Dinornis elephantopus*. The fore part of the tibia internal to the procnemial ridge is impressed by irregular vascular grooves. The fibular ridge is interrupted by a smooth tract, in or near which is the orifice of the canal for the obliquely descending medullary artery in all the species of *Dinornis*. The upper division of the ridge is shorter in the *Dinornis elephantopus* than in the *Dinornis robustus*, and relatively shorter than in the *Dinornis crassus*. The surface between the fibular ridge and the inner border of the shaft at the back part is concave transversely in *Dinornis elephantopus*, not merely flat as in *Dinornis robustus* and *Dinornis crassus*, and, as it descends, it continues longer a flat surface before it changes gradually to a convex one. The oblong rough insertional surface above the inner condyle is relatively shorter and better defined in the *Dinornis elephantopus* than in the *Dinornis robustus*. On the characteristic fore part of the lower end of the tibia, that bone in the *Dinornis elephantopus* repeats all the modifications ascribed to the *Dinornis* in my memoir on the *Gastornis*, or large fossil bird from the Paris eocene*.

The tendinal canal inclines obliquely inwards parallel with the inner border of the expanding end, near which it is placed; the bony bridge spans across it from a flattened tubercle developed from the lower part of the outer pier. The outlet of the canal is as wide as in the *Dinornis robustus*; its aspect is obliquely forwards and downwards. External to the tubercle is an oblique rough depression, relatively narrower and better defined than in the *Dinornis robustus*. The inner condyle is relatively narrower and more produced forwards than in the *Dinornis robustus*, resembling more the proportions of that part in the *Dinornis crassus*. The general form and oblique direction of the wide distal trochlear articulation are closely repeated in all the species, the canal being rather more sharply defined behind in the *Dinornis elephantopus* than in the *Dinornis robustus*. The depression on the entocondyloid surface is less deep in the *Dinornis elephantopus* than in the *Dinornis robustus*.

The above-specified differences, as well as all that I have noticed in the tibiæ of other species of *Dinornis*, are so inferior in degree to those which I have found in closely allied genera, and even in different species of the same genus, of other large land- and wading-birds, as *e. g.* in species of *Ciconia*, and in the existing Struthious genera, as to leave a strong impression on my mind of the generic affinity of the species which I have referred to *Dinornis* and *Palapteryx*, and which species have been divided, with a more liberal imposition of terms, by Dr. Reichenbach into the nominal genera *Anomalopteryx*, *Movia*, *Emeus*, *Syornis*, &c., no additional facts or characters being given by that nomenclator than are to be found in the pages or plates of my own memoirs.

The fibula of the *Dinornis elephantopus* remains, as in other *Dinornithes*, and as in the existing Struthious genera, permanently distinct from the tibia; as a general rule in birds, it soon becomes anchylosed to that bone. In the species now defined it is a straight

* 'Proceedings of the Geological Society.'

styliform bone, 14 inches 6 lines in length. The head is subcompressed and produced, as if slightly bent backwards; the upper articular surface is convex from before backwards, almost flat transversely. The head of the bone is flattened on the inner side, almost flat, but a little convex on the outer side. The fore-and-aft dimension is 2 inches 9 lines, the transverse diameter 1 inch 3 lines. Below the head the bone assumes a trihedral form, with the sides convex, gradually tapering, and blending into a shape elliptic in transverse section, and ending in a point about 9 inches above the ankle-joint. The outer surface of the shaft of the fibula is impressed by two oblong rough surfaces for the insertion of muscles, the upper one 2 inches 9 lines in length; the inner part, which is ridge-like, dividing the fore from the back surface of the bone, presents a rough surface with a median interruption, for the ligamentous attachment to the fibular ridge of the tibia.

Dimensions of the Metatarse of.....	*D. gigan-teus.*		*D. robustus.*		*D. elephan-topus.*		*D. crassus.*	
	In.	Lines.	In.	Lines.	In.	Lines.	In.	Lines.
Length	18	6	15	9	9	3	8	8
Transverse breadth of proximal end ...	4	3	4	6	4	5	3	3
Transverse breadth of distal end.....	5	4	5	3	5	4	3	9
Least breadth of shaft.....	2	3	2	0	2	5	1	9
Fore-and-aft breadth of proximal end...	3	2	3	2	2	10	2	5
Circumference of ditto.....	12	0	12	9	12	0	9	3
Least circumference of shaft	6	3	5	3	6	6	4	6
Breadth of middle trochlea.....	1	10	2	3	2	2	1	8
Length of do. following the curve	5	9	5	4	5	3	4	0

I had hitherto regarded the metatarse of the *Dinornis crassus* (Zoological Transactions, vol. iii. pl. 48, figs. 4 and 5) as presenting the most extraordinary form and proportions of all the restored species of huge wingless birds of New Zealand; but it is strikingly surpassed in robustness and in great relative breadth and thickness by the same bone of the present species, which chiefly on that account I have proposed to name *elephantopus*. Only in the great Maccaws and Penguins do I know of a metatarse with similar proportions to that of this most robust-legged of birds. But the Parrot tribe present those peculiar modifications of the distal trochleæ, with the strong articulation for the back toe, which relate to the scansorial modifications of the bird's foot; and the Penguins associate with their broad and short metatarse a characteristic retention of much of the primitive separation of the three constituent bones. In the *Dinornis elephantopus* these elements have become as completely coalesced as in any other species, and the general characters of both proximal and distal ends accord with those in previously described species. On a more special comparison of the metatarse of the *Dinornis elephantopus* with that of its nearest congener, the *Dinornis crassus*, the following differences present themselves:—The endocondyloid depression is deeper, its fore-and-aft diameter is greater, and its transverse diameter less, than in the ectocondyloid one; but the breadth of the endocondyloid depression is relatively greater, and its depth somewhat less in the *Dinornis elephantopus* than in the

Dinornis crassus. The transverse convexity dividing the two condyloid depressions is relatively broader in the *Dinornis elephantopus*; and the rough surface external to the anterior intercondyloid prominence is more strongly marked. The two calcaneal ridges present an equal prominence in *Dinornis elephantopus*; the ectocalcaneal one is the more prominent in *Dinornis crassus*. The anterior surface of the metatarse differs chiefly in the proportions indicated in the table of admeasurements from that in the *Dinornis crassus*; like most of the metatarses of that species, one or more vascular foramina occur above the subcircular rough surface of insertion of the *flexor pedis*, which occupies the lower part of the shallow depression in the upper and fore part of the shaft. Along the lower half of the shaft, the median longitudinal, and progressively widening prominence, due to the middle of the coalesced metatarsal bones, is rather more marked than in *Dinornis crassus*. The inner side of the shaft is marked at its upper half by the oblique rough tract indicative of the insertion of the powerful aponeurosis of the gastrocnemii muscles. At the back surface the upper part of the middle metatarsal is relatively less prominent than in *Dinornis crassus*. The two vascular foramina occupy corresponding relative positions. All other notable differences are those of size and proportion.

From the metatarse of the *Dinornis robustus* that of the *Dinornis elephantopus* differs most strikingly in its proportions of length to breadth, being little more than half the length, but of nearly equal breadth; the distant trochleæ, however, being relatively less expanded than in the *Dinornis robustus*.

The anterior vascular perforation is less than in the *Dinornis robustus*; the insertional roughness for the *tibialis anticus* below the foramen is of equal size. The upper half of the fore part of the metatarse of the *Dinornis robustus* is longitudinally channelled in the *Dinornis robustus*, not in the *Dinornis elephantopus*. The corresponding part of the back part of the shaft is much more prominent in the *Dinornis robustus*. The characteristics of the metatarse of the *Dinornis elephantopus* are more strongly manifested in the comparison with that of the *Dinornis giganteus*, of which bone it has only half the length, other dimensions being equal or even greater.

Of the depression, which is very faint, in the *Dinornis robustus* for the ligamentous attachment of the rudimental back toe there is no trace in the metatarse of the *D. elephantopus*.

The bones of the foot I shall compare with those of the *Dinornis robustus**, to which they make the nearest approach in size. Equalling, or nearly equalling, the phalanges of that bird in breadth and thickness, they differ chiefly in shortness, but in a less degree than the metatarsi differ. These proportional characters of the species are best and easiest given in the plates. A few minor differences, however, may be noticed: the outer portion of the proximal end of the first phalanx of the inner toe is broader in proportion to its fore-and-aft diameter in *Dinornis elephantopus*. The inner portion of the

* See Trans. Zool. Soc. vol. iv. pl. 1.

proximal end of the first phalanx of the outer toe presents the like difference: the general form of that articular surface is less triangular and more oval in both the specified phalanges of the *Dinornis elephantopus*, one, the under side, being indented as usual in the proximal phalanges of the inner and outer toes.

The modifications in the other phalanges, besides those of size and proportion, are not greater or other than might be expected in different species of the same genus.

The first evidence of the *Dinornis crassus* reached me from a turbary deposit at Waikawaite, in the Middle Island; it formed part of the collection made there by Mr. Earl. I have never received any evidence of the species from the North Island.

In like manner the bones of the much larger bird, which I have called *Dinornis robustus*, and which I was formerly inclined to regard as a variety of the *Dinornis giganteus*, appear to be peculiar to the Middle Island; or at least have not hitherto been found in any locality of the North Island.

The richer series of illustrations of both the *Dinornis robustus* and *Dinornis crassus* in the collection of Mr. Walter Mantell are from localities in the Middle Island; and the abundant illustrations of the *Dinornis elephantopus* are exclusively from one locality in that island; they were obtained at Ruamoa, three miles south of Oamaru Point, or that called the 'Vast Rocky Head' in the new Admiralty map. This fact might give rise to the idea that the original range or locality of the *Dinornis elephantopus* had been a restricted one, unless, at the period when the species flourished, the geographical extent of the Middle Island was widely different from what it now is. Yet Mr. W. Mantell has obtained strong, if not unequivocal evidence, that the *Dinornis elephantopus* and *Dinornis crassus* existed contemporaneously with Maori natives. The bones described in the foregoing pages are in a recent and most perfect condition. They retain the usual proportion of animal matter and have undergone no mineral change.

From the sum of our present information respecting the localities of the several species of *Dinornithidæ*, we may infer that most, if not all, the species of the North Island were distinct from those of the South Island. To birds that could neither fly nor swim—at least swim well,—the channel called Cook's Straits would prove an effectual bar to any migration from one island to another. With each successive addition of materials for a complete history of this most remarkable family of birds, I feel, however, chiefly impressed with the conviction of how little comparatively we still know respecting them, and how much more is likely, through the enlightened co-operation of active, resolute, and accomplished explorers, like Mr. Walter Mantell, to be, hereafter, contributed towards a perfect history of the New Zealand wingless birds.

Of the very remarkable species of *Dinornis* based upon the powerfully developed limbs, the bones of which are described in the foregoing pages, Mr. Mantell's collection includes right and left femora, right and left tibiæ, right and left fibulæ, right and left

metatarsi, and a considerable collection of toe-bones, from which, probably, other entire feet might be reconstructed, in addition to the one of the left foot now submitted to the Society. There are also the two femora and the two metatarsi of an immature bird, apparently, by their proportions, from one individual, to which may also belong the proximal end of a tibia, wanting the articular epiphysis. The femora, as in the other birds, retain the two articular ends, which are simply rougher than in the adult, having been covered by a thicker cartilage, but are not developed upon distinct osseous pieces, as in land mammals. The proximal epiphysis is wanting in both the immature metatarsi, exhibiting the separate expanded ends of the three constituent bones terminating in the three prominent trochleæ below. The length of the femur of this young bird is 11 inches, that of the metatarse $7\frac{1}{2}$ inches. They already present the characteristic robustness of the adult bird*.

April 22, 1856.—Dr. Gray, F.R.S., in the Chair.

On Two New Species of Birds (Nestor notabilis and Spatula variegata) from the Collection of Walter Mantell, Esq. By John Gould, F.R.S.

Mr. Gould brought before the notice of the Meeting two species of birds from the New Zealand group of islands which he conceived to be new to science; one, a magnificent Parrot, pertaining to the genus *Nestor*; the other, an equally interesting species of Duck, belonging to the genus *Spatula*. Both these birds had been placed in his hands for the purpose of describing, by Walter Mantell, Esq.

The *Nestor*, which is called "*Keá*" by the natives, is by far the largest of the three species of the form now known, and is certainly one of the most interesting of the ornithological novelties lately discovered. It not only differs from its near allies *N. hypopolius* and *N. productus* in its greater size, but in the greater uniformity of its colouring, in the yellow toothed markings of the inner webs of the primaries and secondaries, and in the orange toothed markings of the inner webs of the tail-feathers; the yellow colouring of the under mandible is another of the peculiarities by which it may be distinguished.

Mr. Mantell informed Mr. Gould that he first heard of the existence of the *Keá* about eight years ago from some old natives whom he was questioning as to the birds of the Middle Island. They said the *Keá* somewhat resembled the *Káka* (*Nestor hypopolius*), but that, unlike that bird, it was green, and added, that it used formerly to come to the coast in severe winters, but that they had not seen it lately. Mr. Mantell has only obtained the two specimens exhibited of this fine bird; they were shot in the Murihiku country, and for one of them he was indebted to Mr. John Lemon of Murihiku.

The following is a description of this new species, for which Mr. Gould proposes the name of

* This paper will appear in the Transactions of the Society, illustrated with figures of the bones.

NESTOR NOTABILIS.

General hue olive-green; each feather tipped in a crescentic form with brown, and having a fine line of the same colour down the shaft; feathers of the lower part of the back and the upper tail-coverts washed near the tip with fiery orange-red; primaries brown, margined at the base with greenish-blue; tail dull green; inner webs of the lateral feathers brown, toothed on their basal two-thirds with orange-yellow; all the tail-feathers crossed near the extremity with an indistinct band of brown, and tipped with olive-brown; feathers of the axillæ fine scarlet; under wing-coverts scarlet tipped with brown, the greater ones banded with brown and with yellow stained with scarlet; basal portion of the primaries and secondaries largely toothed with fine yellow, which is not perceptible on the upper surface unless the wings are very widely spread; upper mandible dark horn colour; under mandible yellow, becoming richer towards the point; feet nearly yellowish-olive.

Total length, 18 inches; bill, $2\frac{1}{2}$; wing, $12\frac{1}{2}$; tail, $7\frac{1}{2}$; tarsi, $1\frac{5}{8}$.

Hab. The Middle Island, New Zealand.

The Shoveller forms the fifth species known of the genus *Spatula*, and is distinguished from the other members by the dark crescentic markings which decorate the feathers of the breast, sides of the neck and scapularies. The species of this well-defined form previously described are *Spatula clypeata*, which inhabits Europe, North America, India and China; *S. rhynchotis*, which is found throughout Australia; *S. maculata*, the habitat of which is Chili, and probably the neighbouring countries of Peru and Bolivia; and *S. capensis* of South Africa. For the fifth, or New Zealand species, Mr. Gould proposes the name of

SPATULA VARIEGATA.

Crown of the head and space surrounding the base of the bill brownish-black; on either side of the face between the bill and the eye a lunar-shaped streak of white, bounded posteriorly with speckles of black; cheeks, sides and back of the neck dark grey with greenish reflexions; front of the neck dark brown, each feather narrowly fringed with white; back brownish-black, the feathers of the upper part margined with greyish-brown; feathers of the breast, sides of lower part of the neck, the mantle and scapularies white, with a crescent of blackish-brown near the tip; under surface dark chestnut blotched with black; flanks lighter chestnut barred with black; lesser wing-coverts dull greenish-blue; greater wing-coverts dark brown, fringed at the tip with white; first elongated scapularies blue-grey, with a conspicuous line of white on the outer web next the shaft, bounded posteriorly with black; the next blue-grey, margined on the inner web with white; the remainder greenish-black, with a lengthened lanceolate mark of dull or brownish-white down the centre of the apical half; speculum deep green; primaries dark brown with lighter shafts; under surface of the shoulder white; on each side of the vent a patch of white freckled with black; under tail-coverts black, tinged with shining green; tail dark brown; irides bright

yellow; bill dark purplish-black, the under mandible clouded with yellow; legs and feet yellow.

Total length, 16½ inches; bill, 3; wing, 9¼; tail, 4½; tarsi, 1⅝.

Hab. New Zealand.

Remark.—This is by far the handsomest species of the genus.

Descriptions of Two New Species of true Cuckoos (Genus Cuculus as restricted). By John Gould, F.R.S.

Cuculus strenuus, Gould.

Crown of the head, back of the neck, cheeks and chin dark grey; all the upper surface, including the upper tail-coverts, olive-brown, with shining purplish reflexions; tail olive-brown, crossed by four bands of darker brown, and tipped with buffy white; throat white, passing into the chestnut, which forms a band across the lower part of the chest, each feather also has a double mark of black and chestnut down the centre; breast and upper part of the abdomen white, crossed by semicrescentic bands of very dark brown bordered with pale chestnut-red; edge of the shoulder, lower part of the abdomen, vent and under tail-coverts white; upper mandible olive; lower mandible yellow; irides and feet rich yellow.

Total length, 15½ inches; bill, 1¼; wing, 9⅜; tail, 9.

Hab. Manilla.

Remark.—In outward appearance this species so nearly resembles the *Cuculus sparverioïdes*, that one description would nearly serve for both; but in size it so far exceeds that bird, as well as every other true Cuckoo I have yet seen, that I have no doubt of its being distinct, and I have therefore assigned it a separate specific appellation, and have selected the term *strenuus*, as indicative of its great size and strength.

The specimen from which the above description was taken now forms part of the collection at the British Museum.

Cuculus hyperythrus, Gould.

Crown of the head, all the upper surface and wings dark slate-grey; spurious wings white; lores, ear-coverts, moustache, and a spot on the chin black; throat white, with a fine line of brown down the shaft of each feather; under surface dull rusty-red; tail grey, crossed by two narrow irregular bands of black bordered with brown, and by a very broad band of black near the extremity, the tip being reddish-brown; upper mandible black; lower mandible and feet yellow.

Total length, 11½ inches; bill, 1⅛; wing, 8; tail, 6½.

Hab. China.

Remark.—In size this species is rather less than the *Cuculus canorus* of Europe, and is altogether less elegant in its general contour. The rufous colouring of the breast and under surface, and the black marks on the cheeks and throat, characters seldom seen among the *Cuculidæ*, are the features by which it may be distinguished.

The specimen described, like the preceding, is deposited in the National Collection.

3. Note on Buglodytes albicilius, *Bp.* By Philip Lutley Sclater.

Prince Bonaparte, in his "*Notes Ornithologiques sur les collections rapportées par M. A. Delattre,*" read before the French Academy in 1853, has instituted a new genus, *Buglodytes*, allied to *Campylorhynchus*, Spix, and described but one species as belonging to it under the title of *B. albicilius*.

Having had an opportunity of examining this type (which is now in the British Museum), I have to state, that I believe it to be the same bird that was long ago named by Mr. Swainson "*Furnarius griseus,*" and the type of Cabanis' genus *Heleodytes*. It has, however, nothing to do with *Furnarius*, and seems, as Prince Bonaparte has remarked, intermediate between *Campylorhynchus* and *Donacobius*. These forms appear to connect the American *Miminæ* very closely with the Wrens, and to render the position of the former group among the true Thrushes rather doubtful. The synonymy of *Buglodytes albicilius* will stand as follows:—

Furnarius griseus, Sw. An. in Men. p. 325.

Campylorhynchus griseus, Schomb. Reise in Brit. Guian. iii. p. 674.

Heleodytes griseus, Cab. Mus. Hein. p. 80; G. R. Gray, List of Gen. and Subgen. p. 26, no. 404.

Buglodytes albicilius, Bp. Notes Orn. p. 26; G. R. Gray, List of Gen. and Subgen. p. 32, no. 499.

My specimen of this bird is from Trinidad. Schomburgk's were collected in British Guiana. The examples upon which the name *Buglodytes albicilius* was founded were obtained by MM. Verreaux's collector in the vicinity of Santa Martha, on the north coast of New Grenada.

From Trinidad also I possess a bird which seems to be the *Heleodytes minor* of Cabanis. It is so similar to *Heleodytes griseus* in every respect except in size, that I question whether it may not be a variety of age or sex of that species.

On some New or Imperfectly-known Species of Synallaxis. By Philip Lutley Sclater.

1. Synallaxis ruficapilla.

Synallaxis ruficapilla, Vieill. N. D. d'H. N. xxxii. p. 810; Enc. Méth. p. 622; Gal. Ois. pl. 174.

Sphenura ruficeps, Licht. Doubl. p. 42.

Synallaxis cinereus, Max. Beitr. iii. 685.

Synallaxis olivascens, Eyton, Cont. Orn. 1851, p. 150.

Olivascenti-brunnea, pileo toto cum nucha, alis extus et cauda rufis: striga superciliari flavida: loris et regione auriculari nigricanti-cinereis: subtus albicanti-cinerea, hypochondriis et crisso brunnescentibus, ventre medio albicantiore cinereo.

Long. tota 6·0, alæ 2·1, caudæ 3·0.

Hab. Brazil.

2. Synallaxis Spixi, sp. nov.

Parulus ruficeps, Spix, Av. Bras. i. pl. 86, p. 85 (♂).
Synallaxis ruficapilla, Reich. Handb. d. Sp. Orn. p. 158.

Supra olivaceo-brunnea, pileo et alis extus rufis, cauda dorso concolore sed minus olivascente: capitis lateribus et corpore subtus cinereis: gutturis pennis intus nigris, extus argentescenti-albis: ventre medio albo: lateribus et crisso brunnescente tinctis.

Long. tota 6·5, alæ 2·1, caudæ 3·5.
Hab. Brazil.

These two *Synallaxes*, which appear to me to be very distinct birds, have always hitherto been confounded together. Specimens of *S. Spixi* are rather the most abundant in collections, and are usually marked *ruficapilla* or *ruficeps*, names both originally applied to the former species.

The *S. Spixi* may be distinguished by its brown tail, nearly the same colour as the back, not rufous like the head, as is the case in *S. ruficapilla;* by having no traces of yellowish supercilia, the whole sides of the head being uniform grey like the breast, and by its smaller and shorter bill, and longer, narrower and more pointed tail-feathers. The throat-feathers are black, finely edged with silvery white, which gives an appearance of a black patch on the throat when the plumage is slightly raised. In *S. ruficapilla* the throat and breast are uniform cineraceous white, and there is more olive-brown on the flanks than in the other species.

Another bird, very closely allied to these two, is *S. elegans*, which I have lately described, from Bogota. *S. pallida*, Max., is also very similar to *S. ruficapilla*, but has conspicuous white supercilia, and the under parts pale brown. *S. albescens*, Temminck, (which has been also united to *S. ruficapilla* by Prince Bonaparte and other writers) is likewise different, and more closely resembles *S. Spixi*, from which, however, it is to be distinguished by having only the back part of the head rufous. A sixth nearly allied species is the Bolivian *S. Azaræ*, d'Orb.

3. Synallaxis caniceps, sp. nov.

S. dorso, alis caudaque cinnamomeo-rufis: capite toto cervicequegrisescentibus, pileo albescentiore: subtus lactescenti-alba: rostro et pedibus pallidis: remigibus intus nigricantibus: rostro elongato, parum incurvo, flavicante: pedibus pallide brunneis.

Long. tota 5·5, alæ 2·3, caudæ 2·1.
Hab. Brazil.

Mr. Eyton was obliging enough to send me his specimens of *Synallaxes* for examination a short time since, and most liberally offered to allow me to describe any I might think new. A single example of the present species which was in the collection seems different from any previously named. I have therefore taken advantage of Mr. Eyton's kindness to give characters to it under the specific title of *S. caniceps*. There is no other member of the genus

that I am acquainted with that much resembles it in colouring. The rectrices are ten in number.

Mr. Eyton's *S. modesta*, described in 'Contributions to Ornithology' (1851, p. 159), of which the types are in his collection, is one of a small group of species from Bolivia, Chili and Patagonia, consisting of *S. flavigularis*, Gould, *S. sordida*, Less. and *S. brunnea*, Gould; but I am doubtful whether all the four are really specifically distinct.

Professor Reichenbach, in his '*Handbuch der Speciellen Ornithologie*,' has chopped up the genus *Synallaxis* into seven or eight different sections. Some of these ought no doubt to be adopted, but the Professor has unfortunately referred some of the most closely allied species to different sections, and I think it better therefore to continue the employment of the old name for the whole of them, until a more accurate revision and arrangement of the whole of the species can be made.

On the Position of the Genus Proserpina in the System, and a Description of its Dentition.

By Dr. J. E. Gray, F.R.S., P.B.S., etc.

In the Synopsis of the British Museum for 1840 (p. 129), I mention amongst the genera of *Helicidæ* which have a thin edge to the mouth of the shell, a genus named *Proserpina*. It is peculiar amongst land shells for having a series of laminæ revolving in the throat, and the outer surface of the shell polished. This genus has been adopted by Sowerby, Pfeiffer, Jonas, and most other authors.

M. Duclos referred the species to the genus *Carocolla*; Adams, Pfeiffer, and Jonas in some of their earlier works considered them as species of the extended genus *Helix*.

M. d'Orbigny in his work on the Mollusca of Cuba, renamed the genus *Odostoma*, and referred it with doubt to the family *Cyclostomidæ*.

Though the shell is far from uncommon in the West Indies, Cuba, and some parts of the American continent, the animal escaped the researches of Guilding, Adams, Chitty, d'Orbigny and other observers. In 1854, when in Berne, my friend, Dr. Shuttleworth, informed me that it had two subulate tentacles, with the eyes sessile on the outer side of their base; and Mr. Bland has mentioned that the animal has no operculum, and absorbs the septa between the upper whorls of the spire, like some species of the genera *Neritina*, *Auricula*, *Helicina*, *Stomastoma*, and a few *Helices*.

These observations induced me to place the family in my most modern arrangement near *Oligyradæ*.

Mr. Cuming has kindly brought to me a specimen of the genus, with its animal, which M. Sallé discovered under leaves in the mountains of Mexico, at some distance from the sea.

The species is allied to *Proserpina eolina*, but differs in the spire being much more convex; I hence propose to call it *P. Salleana*.

Like *P. eolina*, it differs from all the others I am acquainted with in the upper surface of the whorls being rugose, and only smooth on the lower surface, as is the case with many *Naninæ*, showing, if the smoothness and polish of the surface depend on the extension of the mantle of the animal, that the extension in this kind is confined to the under surface of the shell, as is proved by the examination of the animal itself.

This being the case, I am inclined to form this shell and *P. eolina* into a new genus under the name of *Ceres*, characterized by the roughness of the upper surface and the non-dilatation of the front edge of the mantle, which is believed to be dilated in all the other species of the true *Proserpinæ*.

It will be seen that most authors have placed these Mollusca either with *Helices* or *Oligyræ*, and I was much inclined to follow their example, even after a cursory examination of the animal itself. It has much the external appearance of the animals of the latter family, having a short, broad, annulated muzzle with a triangular mouth, two subulate lateral tentacles, with the eyes sessile on the outer side of their base; a moderately short foot, truncated in front, acute and keeled above and behind, without any appearance of beards or any membranous ridge on the sides; the shell is slightly sunk into a cavity in the front of the upper keeled part of the foot, as if it possessed an operculum; the edge of the mantle is free from the back of the neck, producing an open nuchal respiratory cavity like *Cyclostoma* and *Oligyra*, and other operculated and unisexual land shells.

When the animal is more closely examined, it is found that there is no operculum; the concavity on the front part of the foot into which the under surface of the shell fits is furnished with a continuation of the mantle, having a raised crumpled edge evidently capable of being expanded over the under surface of the shell, and explaining the polished surface of this part of the shell;—a structure I have not observed in any other Mollusca. This extension of the mantle might be mistaken for the mantle of the operculum, which, as far as I know, is always quite distinct and separate from the mantle of the shell, but in this animal the fringed edge of the concavity is in direct continuity with the true or shell-forming mantle, both at the columnar and the outer external angle of the mouth of the shell.

The teeth of the lingual membrane are unlike those of *Cyclostoma* and *Helicina*, which agree with those of *Littorina* and other marine Rostriferous univalves. The teeth resemble those of the typical *Raphidoglossa*, as in the families *Neritinidæ*, *Turbonidæ*, *Trochidæ*, *Roliolidæ*, &c. All the Mollusca hitherto known belonging to these families are aquatic, and all but the genera *Neritina* and *Navicellus* are truly marine. They all have well-developed gills, and the greater part have a more or less developed lateral membrane on each side of the body, furnished with three or more beards on its lower surface, and almost all have the eyes placed on a more or less distinct peduncle at the outer side of the base of the tentacles, all characters

absent in *Proserpina*. But notwithstanding all these peculiarities, I am inclined to arrange the family *Proserpinidæ* (including *Proserpina* and *Ceres*) in the order *Scutibranchia*, section *Raphidoglossa*, and to form a suborder for it under the name of *Pseudobranchia*, in the same manner as the families *Cyclophoridæ* and *Helicinidæ* form the suborder *Phaneropneumona* of the order *Rostrifera*.

It may be thus characterized:—

Pseudobranchia. Gills vascular, branched on the inner surface of the mantle; body and shell spiral; eyes sessile; operculum none.

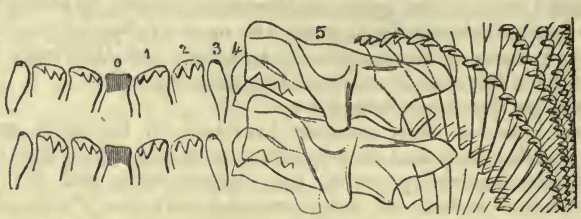
The open respiratory cavity, the separate sexes and the form of the teeth, preclude its being arranged with the *Pulmonobranchiata*, with which it has been hitherto placed on account of its terrestrial mode of life; but as our knowledge of the structure of Mollusca extends, it is found that some *Pulmonobranchiata* are marine, as *Siphonariadæ* and *Amphibolidæ*, in the same manner as the terrestrial *Cyclophoridæ* and *Oligyridæ* are properly arranged with the marine and fluviatile *Rostrifera*. The *Proserpinidæ* might be arranged with the latter families, as was proposed before the teeth were known; but there can be little doubt that the animals which have the very numerous rows of such peculiar-formed teeth as the *Raphidoglossa*, must have very different habits and modes of life from those which have only seven rows of nearly uniform teeth, as the *Tænioglossa* or Rostriferous Mollusca.

And though the animal of the *Proserpinidæ* differs from the more typical *Raphidoglossa*, yet all the peculiarities, except the vascular organs of respiration and terrestrial mode of life, are found in some of the genera of the suborder. Thus the eyes of *Fissurella* are sessile on the outer side of the base of the tentacle; the whole family of *Neritinidæ* and some of the genera of *Fissurellidæ* are destitute of any lateral fringe or beards; so that though these organs are the usual characteristic of these animals, their absence is no proof that the family does not belong to the group, especially when we consider that the teeth have all the peculiarities, indeed, are perfectly typical in form with this well-marked and very peculiar tribe, and very probably it may prove that many terrestrial Mollusca may properly belong to the order.

The lingual membrane elongate, broad, with numerous longitudinal series of close-set teeth; the central teeth in 11 longitudinal series, 5. 1. 5, the two outer teeth on each side being large and irregular; the lateral teeth are numerous, crowded, compressed, linear, nearly equal, transparent, with recurved tip.

In *Ceres Salleana* the lingual membrane is broad, elongate, with close-set teeth. Teeth .00. 5. 1. 5. 00, in numerous longitudinal series; the central tooth is oblong, with a smooth recurved tip, the 1st and 2nd lateral teeth rather broader than the central, with three-toothed recurved tip, the 3rd narrow, elongate, with a slight recurved end, the 4th and 5th much larger, oblong and irregular shaped, the 4th about half the width of the 5th, with 3 or 4 denticles on the inner side of the upper edge; the 5th very large, broad, with a large subcentral reflexed lobe; the lateral teeth are very numerous,

subequal, compressed, transparent, with a recurved tip, which in the inner teeth of the series is bifid.



Teeth of *Ceres Salleana*.

1. Ceres Salleana, Gray.

Shell yellow; upper surface conical, convex, rugulose, with numerous close, parallel, granular concentric striæ; lower surface smooth, polished; keel acute, expanded.

Hab. Cordera, State of Vera Cruz, Mexico, in dense woods, under dead leaves (*M. A. Sallé*).

2. Ceres eolina. *Proserpina eolina*, Duclos, Mag. Zool.

The shell orange; upper surface flat, rugulose, with numerous short, parallel, diverging, narrow, sharp ridges; keel very acute, bent up; lower surface convex, subhemispherical, polished, orange; axial callosity thin, semitransparent, whitish.

GEOLOGICAL SOCIETY.

January 7, 1857.—Colonel Portlock, R.E., President, in the Chair.

The following communications were read:—

1. "On the *Dichodon cuspidatus*." By Professor Owen, F.R.S., F.G.S.

In this paper additional facts were communicated relative to the dentition of the *Dichodon cuspidatus* to those given in the author's original memoir on the species in the 'Quarterly Journal of the Geological Society,' vol. iv. p. 36. They related to the structure of the last molar tooth of the lower jaw, which has a third bicuspid lobe, and to the forms and period of succession of the permanent teeth. The formula of the deciduous dentition was

$$i\frac{3-3}{3-3},\ c\frac{1-1}{1-1},\ dm\frac{4-4}{4-4}=32;$$

that of the permanent dentition is

$$i\frac{3-3}{3-3},\ c\frac{1-1}{1-1},\ p\frac{4-4}{4-4},\ m\frac{3-3}{3-3}=44.$$

The form and structure of all the permanent teeth, with the exception of the fourth premolar, are now known.

The deciduous formula is the same as in the genus *Sus*; the permanent one differs by the displacement of the first deciduous molar